

ASSOCIATION BETWEEN SLAUGHTER PRACTICES AND THE DISTRIBUTION OF *SALMONELLA*, ESBL/AMPC-PRODUCING *ESCHERICHIA COLI* AND HYGIENE INDICATOR BACTERIA ON PIG CARCASSES AFTER SLAUGHTER

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Introduction

Pigs are well-known asymptomatic carriers of foodborne pathogens, which may contaminate pork carcasses during slaughter [1]. Several pig body parts (e.g. the oral cavity, the palatine tonsils and the gastro-intestinal tract) are natural reservoirs of bacteria, including important human pathogens such as *Salmonella* [2,3]. The contamination level of a pig carcass is generally expressed as one value for the whole carcass. However, contamination levels may vary between different carcass areas.

The aim of the study

The aim of this research was to map the distribution of *Salmonella*, ESBL/AmpC-producing *E. coli* and hygiene indicator bacteria on pig carcasses and estimate associations between slaughter practices and carcass contamination.

Material and methods

Seven Belgian pig slaughterhouses were visited two times to sample carcasses before chilling. Each visit, the following 9 carcass areas (100 cm²) from 5 randomly selected carcasses were swabbed using cellulose sponges: head (nose bridge and ears), foreleg, elbow, throat, sternum, belly, ham, pelvic duct and loin. All samples were analyzed for the presence of *Salmonella* by pre-enrichment in Buffered Peptone Water, enrichment Modified Semi-solid Rappaport Vassiliadis and plating on Xylose Lysine Deoxycholate agar. The total aerobic bacteria, *Enterobacteriaceae* and *E. coli* were quantified by direct plating on Plate Count Agar, Violet Red Bile Glucose agar and Tryptone Bile agar with X-Glucuronide, respectively. The presence of ESBL/AmpC-producing *E. coli* was investigated by plating on Tryptone Bile agar with X-Glucuronide supplemented with cefotaxime. Additionally, specific slaughter practices were recorded for each sampled carcass to identify risk factors for microbial contamination.

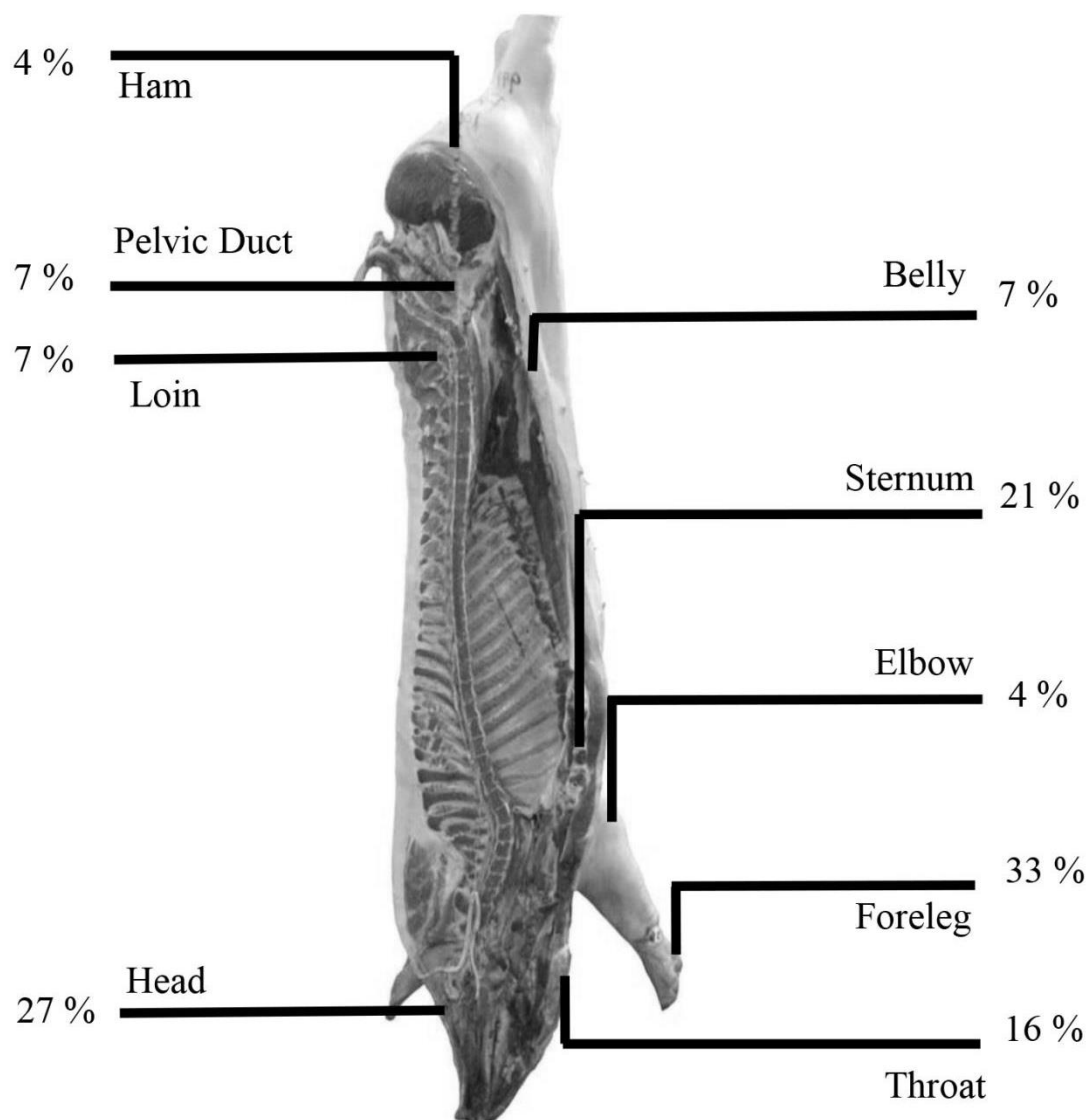


Figure 1. Qualitative analysis of *Salmonella* on pig carcasses before chilling.

Results and discussion

Overall, the average total aerobic count varied between 3.1 (loin, pelvic duct, ham) and 4.4 log₁₀ CFU/cm² (foreleg). Median *Enterobacteriaceae* numbers of all samples collected in the 7 slaughterhouses ranged from values under the detection limit (ham) to 1.65 log₁₀ CFU/cm² (foreleg). Median *E. coli* numbers varied between values under the detection limit (elbow, ham, loin, pelvic duct) and 1.14 log₁₀ CFU/cm² (foreleg). *Salmonella* was recovered from 4% (ham and elbow) to 33% (foreleg) of the samples. In total, 53% of the carcasses were contaminated with *Salmonella*, varying between slaughterhouses from 0% to 100%. ESBL/AmpC-producing *E. coli* was found in 1% (loin) to 23% (head) of the swabs.

The number of *Enterobacteriaceae* and presence of *Salmonella* were higher on the sternum, elbow and foreleg of carcasses from which tonsils ($p < 0.05$) or intestines ($p > 0.05$) were incised. *Enterobacteriaceae* and *Salmonella* were lower at the belly/sternum when an automated belly/sternum opener was used instead of knives and when knives were disinfected prior to opening the belly/sternum compared to the use of non-disinfected knives ($p > 0.05$).

Conclusion

Large variations in contamination levels between different carcass areas were observed. Certain slaughter procedures are significantly associated with the contamination levels of particular carcass areas, which indicates the possibility to implement specific adaptations to improve the microbiological quality of pork carcasses and the need for risk categorization of pork cuts along the production chain.

Literature

1. De Busser, E.V., et al., Vet J, 2013. 196(1): p. 20-7.
2. Morild, R.K., J.E. Olsen, and S. Aabo, Int J Food Microbiol, 2011. 145(1): p. 353-8.
3. Zdolec, N., V. Dobranic, and I. Filipovic, Folia Microbiol (Praha), 2015. 60(2): p. 131-5.